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APPENDIX A

BIOASSAY AND INTERNAL DOSIMETRY

To determine if a worker or a member of the public has inhaled or ingested any radioactive contamination, a test or bioassay can be performed to quantify the amount of radioactive material inside the body. If the radioactive material decays with the emission of a gamma ray, as does cesium-137 (^{137}Cs), an array of sensitive gamma detectors or a whole-body counter can measure the amount of radioactive material in the body. If the radioactive material such as strontium-90 (^{90}Sr) in the body does not emit a gamma ray during decay, the urine or feces of the individual can be collected for a time period, then analyzed in a laboratory by beta counting to determine the amount of radioactive material in the bodily wastes. The body always eliminates some of the radioactive material, and the elimination is at a known rate. If radioactive material is detected, the dose to the individual can be calculated. The whole-body count and urinalysis are two of the bioassay tests used as part of the internal dosimetry performed at the Hanford Site.

The Hanford Radiation Protection Program routinely performs bioassays on workers to ensure that the programs and equipment to prevent intakes of loose surface contamination and airborne contamination in the workplace are performing properly. During an incident where contamination may have been inhaled or ingested, special bioassays of the individuals are performed. Negative results of these special bioassay procedures constitute determinations that no radioactive material has been taken into the individual's body.

During this event, 106 workers have received special bioassays. To date, 105 bioassay results have been received, and none of the test results have detected indications of intakes. (One person who is on short-term disability did not turn in a bioassay kit.)

On September 29, beta/gamma contamination was discovered on an ironworker's boot and personal belongings (e.g., lunch sack, vehicle door handle). Special bioassay was triggered because of the potential for the worker to receive an intake of radioactive material. A whole-body count that evening showed no indication of an intake of ^{137}Cs. Because no characterization data were yet available for the worker, a combination plutonium and ^{90}Sr urinalysis also was ordered for the worker. (On October 10, that bioassay result was reported as negative, i.e., there was no indication of an intake of plutonium or ^{90}Sr.)

DynCorp Tri-Cities Services, Inc., personnel who accompanied the worker to the whole-body counter performed a home radiation contamination survey that evening (September 29). During the survey of the ironworker's home, contamination was detected on five socks (two socks measured 5,500 disintegrations per minute [d/min] per 100 cm^2; two socks measured 3,500 d/min per 100 cm^2; one sock measured 250 d/min per 100 cm^2). At the worker's request, the worker's spouse received a whole-body count and urinalysis on October 5. Both bioassays failed to detect indications of an intake.

Because contamination was found behind B Plant, a meeting was held September 30, 1998, with personnel who had worked in that area. Because that area was not radiologically controlled, it

was not possible to determine from radiological work permits who had worked there. At the meeting, the internal dosimetry technical authority asked the management and craft personnel who were present to identify workers who had been in the contaminated area for follow-up whole-body counts and ^{90}Sr urinalysis. As a follow-up to that meeting, 40 personnel were scheduled to receive special whole-body counts and ^{90}Sr urinalyses to determine if they had received intakes of ^{137}Cs or ^{90}Sr. All whole-body counts and ^{90}Sr urinalyses for these workers were negative, i.e., gave no indication of intakes.

Early in October, the source of the contamination was suspected as having originated in the 241-ER-152 Diversion Pit behind B Plant. The tank farm internal dosimetry technical authority was asked to review radiation work permits for work at that location and to identify those workers who had the highest potential for intakes of radioactive material. Twenty-nine additional workers were identified for special bioassay follow-up. Characterization data for the work area around the 241-ER-152 Diversion Pit and the area behind B Plant show that the contamination consisted primarily of ^{90}Sr with smaller amounts of ^{137}Cs. Based on these characterization data, ^{90}Sr bioassay was determined to be the best special bioassay for these and all subsequent workers who were connected with this incident. Those bioassays were scheduled for delivery to the workers on October 14, 1998.

That list of tank farm workers was expanded to include all 29 workers who had performed work in the 241-ER-152 Diversion Pit. Bioassay results have been received for 28 of these workers and those results were negative.

An additional 6 workers were placed on special bioassay, based on their concerns regarding the spread of contamination and potential for inhaling or ingesting contamination. The results for these workers were negative.